September 1972 B72-10412

NASA TECH BRIEF

Ames Research Center

Purification of Contaminated Water by Filtration Through Porous Glass

The problem:

To purify water that is contaminated by mineral salts and soluble organic compounds.

The solution:

High-pressure filtration of contaminated water through stabilized porous glass membranes.

How it's done:

Porous glass capillaries, sealed at one end, are mounted in a high-pressure filtration cell by means of an epoxy resin. The glass is stabilized by pretreatment of the capillary in the filtration cell with a solution of aluminum chloride (13 g/l) under a pressure of 8.3 MN/m² (1200 psig) for 2 hours. The aluminum chloride solution is then removed, and contaminated water is circulated around the outside of the capillary; the purified water which passes through the capillary walls is collected from the bore.

Salt	g/l	% Rejection
sodium chloride	10	95.4
calcium chloride	1	96.6
magnesium chloride	1	94.7
trisodium phosphate	1	95.4
sodium nitrate	1	93.0
sodium sulfate	1	77.4
ammonium chloride	1	90.9
mercuric chloride	1	97.3
cadmium chloride	1	89.3
lead chloride	1	83.2
urea	10	91.6

Tests have demonstrated that the contaminant cations and anions found in domestic or spacecraft waste waters are largely removed by hyperfiltration through stabilized porous glass membranes. Urea is a characteristic organic substance which is removed by hyperfiltration. Typical rejection values for urea and various salts are given in the table.

References:

1. Ballou, E. V.; Wydeven, T.; and Leban, M. I.: Solute Rejection by Porous Glass Membranes. I. Hyperfiltration of Sodium Chloride and Urea Feed Solutions. Environmental Science & Technology, vol. 5, p. 1032, 1971.
2. Ballou, E. V.; Leban, M. I.; and Wydeven, T.: Stabilization of Porous Glass Hyperfiltration Membranes by Aluminum Chloride Solution. Nature Physical Science, vol. 229, no. 4, p. 123, 1971.

Notes:

1. The percent rejection is simply an expression of the percent removal of a substance, that is, 100(F—P)/F where F is the concentration of salt in the feed water and P is its concentration in the product.
2. Sodium sulfate degrades the porous glass structure, as is evidenced by the low rejection values in the table.
3. No additional documentation is available. Specific questions, however, may be directed to:

   Technology Utilization Officer
   Ames Research Center
   Moffett Field, California 94035
   Reference: B72-10412

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: Theodore Wydeven and
Mark I. Leban
Ames Research Center
(ARC-10635)